

## **REMARKS**

After the foregoing amendment, claims 40-78, as amended, are pending in the application. Claims 44-50 are allowed.

### **The Present Invention**

The present invention is a method for determining the structure of a second network which is exchangeable in applications with a first network. Such networks are called equivalent networks in this application. One way of forming an equivalent network is by rearranging the ordering of nodes at a certain stage but retaining the connections of the inter-stage wiring to each node of the reordered stage.

Not every reordering of the nodes results in an equivalent network. Because the number of possible reorderings is  $k!$ , where  $k$  is the number of nodes in a stage, it becomes a large task to determine the structure of all the possible equivalent networks by trial and error. Advantageously, the present invention provides a method for constructing those specific orderings of nodes that result in an equivalent network.

The ability to form an equivalent network from a known network configuration is important because, except for very small networks, the wiring between the stages of a network (exchanges) dominates the switching network in terms of the area on a chip or on a printed circuit board. One skilled in the art would clearly understand from the discussions at pages 122-131 and from Figs. 44A-44C of the application that being able to determine the structure of an "equivalent network" in a deterministic way, and not by trial and error, has a practical application because the structure of the equivalent network may have a simpler wiring configuration and thus be more economical to construct and/or have improved performance.

### **Rejection - 35 U.S.C. § 101**

The Examiner rejected claims 40, 42, 51, 55, 58, 61, 64, 68, 70, 73 and 76-78 under 35 U.S.C. § 101 as being as being non-statutory subject matter.

The Examiner bears the initial burden of presenting a *prima facie* case of unpatentability. In order to establish a *prima facie* case of unpatentability under 35 U.S.C. section 101, an Examiner must perform the following steps: (see Interim Guidelines for Examination of Patent Applications for Subject Matter Patentability, October 26, 2005):

- a. Establish whether or not the claimed invention falls within an enumerated statutory category;
- b. Establish whether or not the claimed invention falls within a section 101 judicial exception to patentability, i.e. law of nature, natural phenomena or abstract idea;
- c. If the claimed invention falls within a judicial exception, establish whether or not the claimed invention:
  - (1) is a practical application by physical transformation, or
  - (2) is a practical application that produces a useful, tangible and concrete result.; and
- d. If the claimed invention is a practical application, establish whether or not the claimed invention preempts an abstract idea, law of nature or natural phenomenon.

#### Claim 40

Claim 40 recites

*40. A method for configuring an equivalent  $2^n \times 2^n$  k-stage bit-permuting network based on a given  $2^n \times 2^n$  k-stage bit-permuting network having a representation  $[\sigma_0 : \sigma_1 : \sigma_2 : \dots : \sigma_{k-1} : \sigma_k]_n$ , the method comprising:*

*specifying a permutation  $\kappa$  on integers from 1 to n that preserves n, and*

*implementing the equivalent network as  $[\sigma_0 : \sigma_1 : \dots : \sigma_{j-1}\kappa : \kappa^{-1}\sigma_j : \dots : \sigma_k]_n$   $j = 1, 2, \dots, \text{ or } k$ .*

In rejecting claim 40 under section 101, the Examiner states that "claim 1, (taken here as claim 40) is directed to nonstatutory processes ..... that do nothing more than solve mathematical problems i.e. specifying a permutation  $\kappa$  on integer and implementing the equivalent network, which do nothing more than consist solely of mathematical operations without practical application, or manipulate abstract ideas or concepts are more complex to analyze; and the acts of the claimed process are not being applied to appropriate subject matter and thus can not constitute a statutory process." Applicants respectfully traverse the rejection.

In support of the Examiner's statement that claim 40 recites nothing more than mathematical operations without practical application, the Examiner, cites *In re Walter*, 205 USPQ 397 at 407 (CCPA 1980), for the statement "If the mathematical algorithm is merely

presented and solved by the claimed invention, as was the case in *Benson and Flook*, and is not applied to physical elements or process steps, no amount of post solution activity will render a claim statutory; nor is it saved by a preamble merely reciting the field of use of the mathematical algorithm."

Applicant first submits that claim 40 does not recite an algorithm as defined by the U.S. Supreme Court in *Gottshalk v. Benson et al.*, 175 USPQ 673 at 674 (US SpCt 1972). As defined in *Gottshalk v. Benson et al.*, an algorithm is "a procedure for solving a mathematical problem." As would be understood by those of ordinary skill in the art, the mathematical expressions in claim 40 are merely shorthand notation for specifying the interconnections between stages of the network and are not mathematical equations or mathematical formulas which solve a mathematical problem such as were included in the claim at issue in *In re Walter*. Specifically, the expression " $\sigma_0 : \sigma_1 : \sigma_2 : \dots : \sigma_{k-1} : \sigma_k$ " merely defines the interconnections between each stage of a network. The Applicant respectfully requests the Examiner to refer to section C ("Banyan-type networks and trace and guide of a bit-permuting network") of the specification, starting at page 71, and particularly to sub-sections C1 for the definition of "permutation", C2 for "bit-permuting exchange", and C3 for "bit-permuting network". Also, please refer to page 75 of the specification for the notation of a bit-permuting network, which is repeated below for quick reference.

*A  $2^n \times 2^n$  k-stage bit-permuting network can be completely determined by specifying all the inducing permutations of the exchanges of the network. Thus a  $2^n \times 2^n$  k-stage bit-permuting network is denoted as  $[\sigma_0 : \sigma_1 : \sigma_2 : \dots : \sigma_{k-1} : \sigma_k]_n$ , where the permutation  $\sigma_j$ ,  $1 \leq j < k$ , induces the exchange between the  $j^{th}$  and  $(j+1)^{th}$  stages, the permutation  $\sigma_0$  induces the input exchange, and permutation  $\sigma_k$  induces the output exchange.*

Thus, for instance, the expression  $[id : (1\ 2\ 3\ 4) : (2\ 3\ 4) : (3\ 4) : id]_4$  represents the network **44010** shown in FIG. 44A of the specification (attached), with annotations added for better illustration, and where  $\sigma_0$  equals *id* referring to the input exchange (not shown),  $\sigma_1$  equals exchange X(1 2 3 4) referring to the exchange (i.e. interconnection lines) **44012** between stage 1 and stage 2,  $\sigma_2$  equals the exchange X(2 3 4) referring to the exchange **44013** between stage 2 and stage 3,  $\sigma_3$  equals exchange X(3 4) referring to the exchange **44014** between stage 3 and stage 4, and  $\sigma_4$  equals *id* referring to the output exchange (not shown). Similarly, the expression

$\sigma_0 : \sigma_1 : \dots : \sigma_{j-1} \kappa : \kappa^{-1} \sigma_j : \dots : \sigma_k$  defines the interconnections of the equivalent network. For example,  $[id : (1\ 2\ 3\ 4)(3\ 2\ 1) : (1\ 2\ 3)(2\ 3\ 4) : (3\ 4) : id]$  denotes an equivalent network (shown as the network **32020** in FIG. 44B of the specification) based on the base network  $[id : (1\ 2\ 3\ 4) : (2\ 3\ 4) : (3\ 4) : id]$  mentioned above. Thus, claim 40 does not include a mathematical algorithm but merely a definition of the interconnections of an equivalent network based on the connections of a base network.

Further, the Examiner's inference that the limitations of claim 40 are merely "data gathering" or of "insignificant post solution activity" is inapposite to determining whether claim 40 is statutory subject matter, since the Freeman-Walter-Abele Test, from which these terms derive, has been deemed to be of little applicability to determining the presence of statutory subject matter. (See *ATT Corp. v. Excel Communications*, 50 USPQ2d 1447 at 1453 (Fed Cir 1999) and *State Street Bank and Trust Co. v. Signature Financial Group, Inc.*, 47, USPQ2d 1596 (Fed Cir, 1998).

Even if the claim 40 is deemed to include a mathematical algorithm, which it does not, claim 40 is still patentable subject matter if: (See *ATT Corp. v. Excel Communications*, 50 USPQ2d 1447 at 1452-1453 (Fed Cir 1999) overruling *In re Walter*)

- (1) it is a practical application by physical transformation, or
- (2) it is a practical application that produces a useful, tangible and concrete result.; and
- (3) the claimed invention does not preempt an abstract idea, law of nature or natural phenomenon.

Claim 40 is clearly a practical application by physical transformation. As discussed above, claim 40 expresses a practical application because the reconfiguration of a bit-permuting network leads to a new network structure which may be a more efficient network structure. Further, the reconfiguration of the bit-permuting network is clearly a physical transformation because the structure of the original network is changed to the equivalent structure. An Example of the physical transformation of a bit permuting network to an equivalent network based on claim 40 is described in the specification at page 124, line 16 to page 125, line14, with the help of the illustrations shown in Figs. 44A-44C. The Examiner is respectfully directed to the section E of the specification for how to construct an equivalent network from a given base network through "cell rearrangement".

Further, the steps of claim 40 lead to a useful, tangible and concrete result, i.e. the structure of an equivalent bit-permuting network.

Also, claim 40 does not claim the expression  $[\sigma_0 : \sigma_1 : \dots : \sigma_{j-1} \kappa : \kappa^{-1} \sigma_j : \dots : \sigma_k]_n$ ,  $j = 1, 2, \dots, \text{or } k$  as such of attempt to forestall its use in any other application. It is clear from the written description that claim 40 uses the aforementioned expression only to determine the structure of a reconfigured bit-permitting network. Further, the claim 40 does not prevent the same structure of the equivalent network to be used if found by another method.

The Examiner has not established a *prima facie* case of unpatentability of claim 40 because he has not shown that the present invention recites an algorithm, or lacks a practical application by physical transformation, does not produce a useful, tangible and concrete result. Applicants submit that claim 40 is statutory subject matter. Accordingly Applicants respectfully request reconsideration and withdrawal of the §101 rejection of claim 40.

The Examiner rejected claims 42, 51, 55, 58, 61, 64, 68, 70, 73 and 76-78 for the same reasons as claim 40. Claims 42, 51, 55, 58, 61, 64, 68, 70, 73 and 76-78 are patentable for the same reasons that claim 40 is patentable. Accordingly Applicants respectfully request reconsideration and withdrawal of the §101 rejection of claim 42, 51, 55, 58, 61, 64, 68, 70, 73 and 76-78.

Claims 41, 43, 45-47, 52-54, 56-57, 59-60, 62-63, 65-67, 69, 71-72 and 74—75

The Examiner rejected claims 41, 43, 45-47, 52-54, 56-57, 59-60, 62-63, 65-67, 69, 71, 72 and 74-75 by virtue of their dependence on claims 40, 42, 51, 55, 58, 61, 64, 68, 70, 73 and 76-78. It is respectfully submitted that since claims 40, 42, 51, 55, 58, 61, 64, 68, 70, 73 and 76-78 have been shown to be allowable, claims 41, 43, 45-47, 52-54, 56-57, 59-60, 62-63, 65-67, 69, 71, 72 and 74-75 dependent on claims 40, 42, 51, 55, 58, 61, 64, 68, 70, 73 and 76-78 respectively are allowable, at least by their dependency. Accordingly, Applicants respectfully request reconsideration and withdrawal of the § 101 rejection of claims 41, 43, 45-47, 52-54, 56-57, 59-60, 62-63, 65-67, 69, 71-72 and 74—75.

### Conclusion

Insofar as the Examiner's objections and rejections have been fully addressed, the instant application, including claims 40-78, is in condition for allowance and Notice of Allowability of claims 40-78 is therefor earnestly solicited.

If the Examiner is still of the opinion that the claims are unpatentable, Applicants would appreciate the Examiner contacting the Attorney of record with suggestions on how the rejection may be overcome.

Respectfully submitted,

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(Date)

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